ROYAL GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 12.] DECEMBER. [1887.

XXI.—CUBEBS.

(*Piper Cubeba*, L.)

The rapid rise in value which in recent years has occurred in cubebs has drawn considerable attention to this pepper. It may be useful, therefore, to correspondents in the Tropics to have before them a brief summary of information on the subject. To this we are enabled to add drawings of the male and female plant of *Piper Cubeba*, L., taken from a Java plant, and one of Miquel's types, in the Kew Herbarium. This is *Cubeba officinalis*, Miquel, and *Piper caudatum*, Hort. non Vahl. There are good figures of this species given by Berg and Schmidt, *Officinellen Gewächse*, t. 29a, and in Baillon, *Histoire des Plantes*, Vol. III., fig. 508. The plant figured by Bentley and Trimen (except the details which are correct) in Med. Plants, plate 243, as from the Royal Gardens, Kew, has been proved to be *Piper Chaba*, Hunter [Chavica officinarum, *Miquel*], belonging to the long-pepper group.

The cubeb plant, like those which supply the black pepper and the long pepper, is a climbing shrub with smooth round stems, which are somewhat swollen at the joints. The leaves are alternate, on short stout stalks, with a lanceolate blade of about 5–6 inches long,

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1887.

Price Twopence.

terminating in a sharp point. The base of the leaf is often unequal and somewhat folded in drying. The flowers are unisexual, and appear on separate plants (diœcious). They consist of cylindrical solid spikes coming off opposite the leaves. The male spikes are long and slender, while the female spikes are shorter, thick, and fleshy, and provided with a short peduncle.

The fruit (which appears only on female plants) is small, and very similar in size and appearance to black pepper. It is, however, provided with a stalk-like base, which is a little longer than the globular extremity. Numerous fruits, when approaching ripeness, are ranged horizontally on a common axis, forming a lax raceme (*see* engraving). This pepper appears to be found wild only in Java, Sumatra, and Borneo. In the former islands cubebs are regularly grown, and they form an important (though irregular) article of export. They often come to this country through Singapore. According to Descourlitz, cubebs were at one time cultivated as an introduction by the French in the West Indies. At present they are unknown there.

The produce of other species of Piper are sometimes called cubebs, as, for example, the native cubeb of Mauritius (*cubebe du pay*), which is *Piper borbonense*, Cas. De Candolle. The cubeb pepper of West Tropical Africa is *Piper Clusii*, Cas. De Candolle. This latter, according to Stenhouse, quoted by Flückiger and Hanbury, contains Piperin and not Cubebin. Under the stimulus of high prices, numerous adulterants are being introduced to increase the bulk of true cubebs. Amongst these *Piper crassipes*, Korthals, has been lately described (Pharm. Journal, [3], XV., 653, and XVIII., p. 269). The fruits of *Piper caninum*, A. Dietr., a plant of wide distribution throughout the Malay Archipelago, are also introduced. These are smaller than true cubebs, and have a stalk-like base only half the diameter of the globular extremity.

The cultivation of cubebs appears to be very similar to that of the ordinary black pepper. Trees are requisite for shade and for supporting the vines. At the foot of these the young plants are first started. When fully grown the cubeb vine climbs to the height of 18–20 feet, and forms a large bush. In Java small plantations are specially devoted to cubebs; but latterly they have been cultivated also on coffee estates by European planters.

The fruits are gathered when full grown, but before they are quite ripe. They are then carefully dried with the stalk attached; hence on this account they are sometimes called "tailed pepper." Cubebs have a warm aromatic and somewhat "camphoraceous" taste. The smell is highly aromatic, and by no means disagreeable.

Cubebs have stimulant and diuretic properties. The chief use of cubebs in European countries has been for various forms of syphilitic disease. Latterly they have been largely used in America in the preparation of asthma cigarettes.

According to the *Chemist and Druggist* the price of cubebs has always been subject to sudden and violent fluctuations. In 1865 the price averaged 77*s.* 6*d.* per cwt.; from 1875 to 1880 cubebs could be bought at prices ranging from 25*s.* to 55*s.* per cwt. Since 1880 the price has steadily gone up, and "good genuine cubebs" in 1886 realised 20*l.* to 22*l.* per cwt.

In the Kew museums there are specimens of the fruits of *Piper Cubeba* from Nepaul and Madras, India Museum; these are probably bought in bazaars, and not grown locally. Commercial cubebs from Java and Sumatra are represented by samples contributed by Messrs. Burgoyne, Burbidges, and Co. West African cubebs, the produce of

Piper Cubeba, L.—1. Female plant; 2. Male plant.

Piper Clusii, are represented by specimens from the Yoruba country by Mr. Barber; from Sierra Leone by Dr. Clark; from Bahia, brought from the West Coast of Africa by negroes, under the name of "Irrei," by Mr. J. Wetherell; and from the Sierra Leone exhibits at the Colonial and Indian Exhibition, 1886, under the name of "Yaray," by the Commissioner.

In addition to these there are samples of cubeb oil and cubebine, illustrating the products of *Piper Cubeba;* and samples of false cubebs as usually used for purposes of adulteration, which are probably the fruits of *Piper crassipes.*

XXII.—SABICÙ WOOD.

(*Lysiloma Sabicu*, Benth.)

In the Bahamas Court at the late Colonial and Indian Exhibition there were shown specimens in the form of ship's knees of a timber known locally as "Horse-flesh Mahogany." It was described as a "heavy and rather hard wood, much valued for the framing of houses, high class joinery, and ship-builders' purposes." It was said to be "impervious to all insects and of very great durability, having been found perfectly sound after a century of exposure."

One of the specimens was presented to the museums of the Royal Gardens, Kew, but its botanical origin was then unknown. The value of the timber being unquestionably of a high order, it was thought desirable to ascertain more about it, and, if possible, to determine exactly the species yielding it. With this view, a communication, dated 27 November 1886, was addressed to the Colonial Office, and at the instance of H.E., H. A. Blake, C.M.G., Governor of the Bahamas, Mr. Fred. Taylor was instructed to prepare specimens of the foliage, flowers and fruit of "Horse-flesh Mahogany" and forward them to Kew. The specimens were recently received here, and Professor Oliver arrived at the conclusion that they were identical with *Lysiloma Sabicu*, Benth., a species which has long been known to yield the celebrated Sabicú wood of Cuba. Hence, the point would appear to be established that the Horse-flesh Mahogany of the Bahamas and the Sabicú wood of Cuba are botanically one and the same thing.

Sabicú wood, also known as Savacú and Savicó wood, has been imported in considerable quantities from Cuba, where alone the tree was supposed to exist. It is described as a "dark coloured wood, very "heavy, excessively hard, and extremely durable, the two latter qualities "rendering it of great value to the shipbuilder, by whom it is much "esteemed." The stairs of the building for the great exhibition of 1851 were made from this wood, and, notwithstanding the immense number of people who passed up and down, the wood was found, at the close of the exhibition, to be scarcely at all the worse for wear (Treasury of Botany, p. 704). Sabicú wood has also more recently been used for shuttles and bobbins, but the demand for this purpose was never very large.

Since the botanical identity of Horse-flesh Mahogany and Sabicú wood has been established, it has been found that timber, under the name of "Sabicú," had already been exported in small quantities from the Bahamas, and in the "Report of Governor Robinson on the Blue

M.S. del. et lith.

F. Dangerfield, lith. London. 2.88 15673.

Lysiloma Sabicu, Benth.

Book of the Bahamas for 1879," p. 10, it is stated that 66 tons were shipped in 1879 and 167 tons in 1878. Further, in a letter dated 5th May 1887, Messrs. G. S. Saunders and Co., New London Street, E.C., inform us that they had received "a log of Sabicú from Jamaica, but under a nondescript name"; while several imports of genuine wood had been received from the Bahamas, but generally small and badly grown, and (which Cuba and St. Domingo wood is not) very liable to "wormy centres and outsides."

It is evident that at the Bahamas the tree is much smaller than in Cuba, and, probably owing to the soil or climate, it seldom attains a greater height that 30 feet. The stem also would appear to be stunted and crooked, owing to exposure to strong winds. The trees in Cuba are said to yield fine straight stems several feet in diameter.

Specimens of Sabicú wood in the Kew museums are (1) from the Admiralty, received Nov. 16, 1855; (2) from Messrs. Saunders, received May 1887, said to be slightly "redder in colour" than usual; and (3) to these has now been added the fine piece or "ship's knee" received as Horse-flesh Mahogany from the Bahamas Court at the Colonial and Indian Exhibition, 1886. As regards the latter specimen, the curator of the museums points out that the Bahamas wood is comparatively light in weight, of a reddish colour, with occasional dark streaks. The rings are clearly defined, while the medullary rays are wide and numerous. The pores are small, scattered, and each contains a white deposit. This wood is much softer than the regular Sabicú wood of commerce, and is easily cut.

We are enabled, by permission of the Bentham Trustees, to add to this note a plate prepared for the *Icones Plantarum* of the plant yielding Sabicú wood. This will, no doubt, prove of considerable interest to correspondents in the West Indies; and it may also lead to the tree being recognised as growing in other places than those here indicated.

XXIII.—MEXICAN FIBRE OR ISTLE.

(*Agave heteracantha*, Zucc.)

Under the name of Mexican fibre or istle, a short and somewhat harsh and stiff fibre comes into the London market, which is used in the manufacture of cheap nail and scrubbing brushes, and for various purposes where a substitute for animal bristles is allowed. Messrs. Ide and Christie mention "that this fibre is pretty largely imported for "brush-making purposes, and its value in London [15th October 1887] "is 26*l.* per ton. The range of value of late years has been from 22*l.* "per ton to 50*l.* per ton. The fibre is quite unique as a vegetable "substitute for animal bristles, and is used in the manufacture of cheap "brushes of all sorts."

The origin of this Mexican fibre or istle has been involved in a good deal of doubt, but we believe that we have been able to trace its origin by means of material collected many years ago, and now available at this establishment. Some specimens of a stiff fibre and brushes in the Kew museums were received from Dr. Parry in 1879, and said to be derived from *Agave Lechuguilla*. Dr. Parry wrote the introduction

to Torrey's *Botany of the Mexican Boundary*, which was published in 1858, and he states on page 11, speaking of the vegetation of the cretaceous formation, "Upon the rocky ledges a small species of Agave "grows in abundance. The low leaves, which are pointed with sharp "spines, are very troublesome to the foot traveller; they are, however, "of some use to the Mexicans, who employ the strong fibres they "contain in making coarse ropes. The plant is known to the people "of the country as 'Lechaguia.'"

According to Torrey, in *Botany of Mexican Boundary Survey*, p. 213, it appears there is a distinct species of Agave of this name [*Agave Lechuguilla*, Torrey], and "the fibres of the leaves are used for making coarse rope, bagging, &c." This species, by Baker, in *Gardeners' Chronicle*, Vol. VII. (new series), p. 527, is placed under *Agave Poselgerii*, Salmdyck. Engelmann on the other hand looked upon *A. Poselgerii* and *A. Lechuguilla* as identical with *Agave heteracantha*, Zucc., and described them under that name. Hence we may look upon *Agave Lechuguilla*, Torrey, *A. Poselgerii*, Salmdyck, and *A. heteracantha*, Zucc., as synonymous names representing one and the same plant; and of these *Agave heteracantha*, Zucc., has priority as regards date, being published nearly fifty years ago.*

It would appear, therefore, that Parry's specimens of fibre and samples of brushes made from it were derived from *Agave heteracantha*, Zucc., the local name of which is Lechuguilla. This name is, however, by no means restricted to this species. Sereno Watson (*Proceedings of the American Academy*, Vol. XI., p. 16) mentions "Lechuguilla" or "Lechigilla" as the native name of *Agave guttata* and *A. variegata*. These latter are species belonging to quite another group, and as different as possible from *A. heteracantha*. It is very possible, therefore, that the name Lechuguilla, like Kerrato in the West Indies, has a wide stretch of usage in certain parts of Mexico and the United States, and that it is applied indiscriminately to various species of Agave.

There is at Kew a very large collection of living Agaves, in which are represented most of the species here concerned.

By the courtesy of Messrs. Death and Ellwood, Engineers, Leicester, we have been enabled to extract fibre from the leaves of *Agave heteracantha*, Zucc.; *A. xylacantha*, Salmdyck; *A. horrida*, Lemaire; *A. Kerchovei*, Lemaire; *A. lophantha*, Schiede; *A. univittata*, Haworth; and *A. multilineata*, Baker. All these yield a coarse and somewhat rigid fibre, but the fibre of *A. heteracantha*, allowing for the age of the plant, comes nearest to the commercial fibre known in London as Mexican fibre or istle.

All these species, it may be mentioned, belong to a distinct set of Agaves, the leaves of which are characterized by a continuous horny margin, and hence placed together by Baker under the group Marginatae, of which the distictive characters are,—"edge of the leaf "furnished all the way down from the top to the bottom with a "distinct horny border, of the same texture as the teeth."

The species of *Agave* which yield Sisal hemp and fibres suitable for rope making and weaving, are discussed in the *Bulletin* for March [No. 3, 1887]. Such fibres are ordinarily 3 feet, and often 5 and

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* It may be mentioned here that what Baker described as *Agave heteracantha*, Zucc. (?), in *Gardeners' Chronicle*, Vol. VII. (new series), p. 369, has been proved to be a new species, and it is proposed by him to describe it under the name of *Agave multilineata*.

6 feet in length. They are soft and pliable, not so stout as the Mexican fibre or istle, and would scarcely answer the same purpose. This latter is generally only about a foot or a foot and a half in length, and is stout and rigid.

There is little doubt, therefore, that Mexican fibre or istle is derived from a group of Agaves with short leaves, and from the material available at Kew, the evidence is strongly in favour of *Agave heteracantha*, Zucc., being the species chiefly concerned. Indeed the specimens contributed by Dr. Parry to Kew in 1879, afford direct proof on this point. Since the above remarks were written we have been favoured by Dr. Newberry with a reprint of an article of his in *The Popular Science Monthly* for November 1887, entitled "Food and Fibre Plants of the "North American Indians." At page 10 we find he identifies the "lechuguilla" of the Indians with *Agave heteracantha*, and attention is particularly drawn to the size of the leaves, about a foot to 18 inches in length, and to the very strong character of the fibre contained in them. Dr. Newberry's observations are:—

"Another less known but scarcely less valuable plant belonging to "the same genius (*Agave*), is the 'lechuguilla' (*Agave heteracantha*) "of Chihuahua and the surrounding country. Of this, the leaves are "from a foot to 18 inches in length, and grow in a tuft like those of "the century plant (*Agave americana*). Though separated with some "difficulty from the parenchyma in which they are enveloped, the "fibres that traverse the leaves are numerous and very strong, and "are largely used by the Mexicans for the manufacture of ropes, "sacking, &c."

In the Kew museums there are specimens of Mexican fibre as follows:—Prepared Mexican or istle fibre, from Mr. A. Rowbottom; fibre used by the Indians for making ropes and coarse sacking, from Dr. Parry, 1879; a piece of cordage and Mexican hair brush, made from Mexican fibre, contributed also by Dr. Parry; and Mexican fibre or istle as sold in London (value 26*l.* per ton), received from Messrs. Ide and Christie, 15th October 1887.

XXIV.—FOOD GRAINS OF INDIA.*

In an illustrated work entitled the "Food Grains of India," published in 1886, for the Committee of Council on Education, and based upon information acquired by the India Office in connexion with the late India Museum, Professor Church deals somewhat fully with the alimentary value of the chief food grains of our Eastern Empire.

A few notes on the cultivation of some of the crops have been incorporated with the work, while an endeavour has been made to show how a knowledge of the composition of the several food grains may be utilised in the fixing of rations and the adjustment of dietaries.

Under cereals the classification and characteristics of millets, maize, rice, wheat, and bamboo rice are discussed.

Since the publication of the work in question, Professor Church has extended his investigations with material supplied from Kew into the

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* Food Grains of India, by A. H. Church, M.A. Oxon, F.C.S., F.I.C., with numerous woodcuts.—London: Chapman and Hall, Limited, 1886.

merits of two other grains, viz., the Mitenga bamboo, *Bambusa Tulda*, Roxb., and *Panicum flavidum*, Retz. The results, given below, are intended to be a continuation of, and supplemental to, the information already given in the handbook :—

BAMBUSA TULDA, Roxb. *Synonym: Dendrocalamus Tulda*, Nees. *Hind*, Peka. *Beng*, Tulda, jowa, mitenga, matela. *Burm*, Theiwa, thoukwa, or thaikwa.

This is the common bamboo of Bengal and grows abundantly everywhere. It is also found in Pegu and Martaban, down to Tenasserim, but cultivated in Chittagong and elsewhere (Kurz). The tender shoots are eaten as pickles by the natives. The plants flower in May. The grain examined was received at Kew through the Government of India from the Conservator of Forests, Bengal.

A sample of the grain of this bamboo gave, when freed from husk, the following numbers on analysis :—

Water	13·5	per cent.
Albuminoids	10·8	„
Starch	71·6	„
Oil	·6	„
Fibre	2·1	„
Ash	1·4	„
	100·0	

These per-centages are very similar to those furnished by the grain of *Bambusa arundinacea* (Willd.), but the individual corns are much larger, 70 of them weighing 100 grains, while 300 grains of the latter species are required to make up the same weight.

PANICUM FLAVIDUM, Retz. *Synonym: Panicum brizoides*, L. *Tel.*, Oda, or Woodoo-gaddi.

This grass is widely distributed in the East Indies. Roxburgh describes it as common in every soil and situation, even in deep water ; in one that is rich and moist it is often 2 to 4 feet long, and again on a soil that is dry and barren, only as many inches. It grows in tufts, and various parts of it are often tinged purple. The grain here described was obtained through the Government of India from the superintendent of the Government Botanical Gardens, Saharunpore.

This species of Indian millet is occasionally employed as food, especially in times of famine. The husked grain gave on analysis the following results :—

Water	11·8	per cent.
Albuminoids	9·6	„
Starch	54·1	„
Oil	6·3	„
Fibre	12·0	„
Ash	6·2	„
	100·0	

The small grains of this millet contain much more indigestible fibre than any species yet examined, but they are exceptionally rich in oil or fat, containing nearly twice as much of this constituent as any other kind.

XXV.—BROOM ROOT OR MEXICAN WHISK.

(*Epicampes macroura*, Benth.)

In the Report of Her Majesty's Consul at Vera Cruz for the year 1886, Mr. Baker draws attention to a comparatively new industry connected with the preparation and export of what is called "Broom Root."

This root was exported from the port of Vera Cruz last year to the aggregate value of 58,632*l*. The bulk appears to have been shipped to Germany and France, while the quantity shipped to England was comparatively small. The Curator of the Museum [Gardeners' Chronicle, Vol. II. (third series), p. 104] has established the fact that the broom root exported from Vera Cruzs is known in Europe as Mexican or French Whisk. It is used by the Germans and French to mix with Venetian whisk, derived from the roots of *Chrysopogon Gryllus*, for the manufacture of dandy brushes, clothes brushes, carpet brushes, and velvet brushes, which are shipped to this country at exceedingly low prices. The broom root, therefore, appears to be a cheap substitute for Venetian whisk, and it is said that when made into brushes and thoroughly dry it is apt to become brittle and break off. For this reason it has never found much favour in England.

As the botanical origin of broom root was unknown, efforts were made through the Foreign Office to obtain specimens of the plants yielding it. These specimens were obligingly forwarded to Kew by Mr. Consul Baker, and received on the 3rd October. It appears that the plant yielding the so-called broom root is a grass whose local name is Zacaton. This is a plant with coarse tufted leaves, found widely distributed over the highlands of Mexico, and attaining a height of six or seven feet. The roots, in the condition in which they are exported, are called "Raiz de Zacaton." These roots are about nine inches to a foot long, possessing a wavy character, and about one-sixteenth of an inch in diameter. They have evidently undergone some cleansing and bleaching process which gives them a bright appearance and a pale yellow colour.

Among the specimens sent by Mr. Baker to Kew there were two species of grasses, both of which evidently belonged to the genus *Epicampes*. One was *Epicampes macroura*, Benth., [Cinna macroura, *Kunth.*], and the other a closely allied species which could not be determined without flowers. There can be little doubt, therefore, that the broom root is derived from one or more species of grasses belonging to the genus *Epicampes*.

Sereno Watson, *Botany of California*, Vol. II., p. 277, mentions the distribution of one species of this genus, viz., *Epicampes rigens*, Benth. (*Cinna macroura*, Thurb.), as San Diego County, California, and also in Mexico and eastward in New Mexico and Western Texas. It is known as "Wood Reed-grass." It is described as a tall-growing, very rigid, wiry grass, of a pale yellowish green colour, growing in sub-alkaline localities and apparently in tufts. The rigid stems are used by the Indians for making baskets.

XXVI.—CONTRAYERVA.

Dorstenia brasiliensis, L.
Dorstenia Contrajerva, L.
Aristolochia odoratissima, L.

Contrayerva, as usually known, consists of the root-stock and roots (scaly rhizomata) of *Dorstenia brasiliensis*, L., and *Dorstenia Contrajerva*, L. The former is a native of the forests of Tropical America from Venezuela to Brazil, while the latter is chiefly confined to the West India Islands and Venezuela. According to Pereira (Mat. Med., Vol. II., p. 1252), *D. brasiliensis* yields "the contrayerva root usually "met with in the shops." It is described as composed of irregularly curved roots of a yellowish brown colour. The taste is warm, bitterish, and slightly acrid.

The name *contrayerva* is an Indo-Spanish term, originally applied to species of *Dorstenia*, on account of the counter-poison properties supposed to be possessed by them. They are, however, little used now, and for all practical purposes are obsolete. They had been employed in fevers of a low type, and in other diseases requiring a mild, stimulant, and diaphoretic treatment. A full description with plate is given of *Dorstenia Contrajerva*, L., by Descourtilz in *Flore Medicale des Antilles*, Vol. III., p. 256, t. 207. The only figure we have met with of *Dorstenia brasiliensis*, L., is given by Nees von Esenbeck in *Plantes Medicinales*, Dusseldorf, t. 99.

Contrayerva, as usually in use, therefore refers to the roots of species of Dorstenia. In Jamaica, however, this term is invariably applied to a species of *Aristolochia*, while roots of *Dorstenia* are there called Spanish Contrayerva. From dried specimens and living plants lately contributed to Kew by the Botanical Department, Jamaica, and by Joseph Shearer, Esq., of Vale Royal, there is no doubt that Jamaica Contrayerva is *Aristolochia odoratissima*, L., a weak climbing plant, very common on roadside walls and banks. The flowers are variegated purple, with a lip 6 inches long and a tail nearly a foot long. The whole plant when dry has a pungent, disagreeable odour. It is figured by Sloane, t. 104, f. 1, and by Descourtilz (as above), Vol. V., t. 536. In Jamaica, where horse-rearing is an important industry, this Contrayerva (Aristolochia) is regularly used in treatment as a powerful anthelmintic. It is evident that it has been so used for a long period. In Lunan's *Hortus Jamaicensis*, Vol. I., p. 232, we find that—

"This [plant] is called Contrayerva in Jamaica, from its great efficacy "against poisons, but is in no respect like the Spanish contrayerva."

. . . . . .

"The roots and seeds are very bitter, hot, and odoriferous, and are "most excellent alexipharmics or counter-poisons, strengthening the "heart, stomach, and brain; they cure the bites of serpents, and the "poison of Indian arrows. I am of opinion, it exceeds the Spanish "contrayerva, especially in dropsies."

Long, in the history of Jamaica, p. 717, mentions that this Aristolochia "abounds everywhere among the woodlands and thickets "on the south and north sides of the island, and rises frequently to a "considerable height among the trees and bushes. It destroys worms, "for which purpose the root (which has a strong smell) is chopped in "small pieces, and given by the planters to their horses, mixed with

" corn, which destroys bots, and wonderfully recruits the animals' flesh
" and strength.

" It is so abundant in this island that it may be collected annually,
" in large quantities, for exportation, if there was a demand for it at
" the home market; and it seems to merit this encouragement, as it has
" been thought by very able physicians to be superior in efficacy to
" the Spanish contrayerva."

XXVII.—INTRODUCTION OF THE BRAZIL NUT TO THE EAST INDIES AND AUSTRALIA.

(*Bertholletia excelsa*, Humb.)

The plant yielding the common Brazil nuts of commerce is a lofty tree, locally known as "Castanea," native of the forests of Guiana, Venezuela, and Brazil. It grows gregariously in large forests, and belongs to the tribe *Lecythideæ* of the natural order *Myrtaceæ*. The "nuts," generally from 15 to 25 in number, are contained in a spherical shell about the size of a child's head, but of an extremely hard woody texture. Inside this the nuts are closely packed round a central axis, and hence the wedge-shaped or triangular form assumed when ripe. The walls of the shell are about half an inch in thickness, and they are so firm and compact in texture that it necessary to break them with an axe before the triangular wrinkled nuts can be extracted. This latter work is done by Indians, in the forests, and the nuts are then brought down the rivers in canoes to the port of shipment.

Brazil nuts form an important article of commerce, and about 70,000 bushels are annually imported into this country and used chiefly for dessert purposes. The ordinary kinds come from Pará and are sometimes called Pará nuts. The best nuts, styled "bold Manáos Brazils," which command the highest prices, come from Manáos, an inland town on the Rio Negro, and in the province of that name.

The nuts ripen and fall from the trees in February and March, and fresh nuts arrive in Europe in May and June.

While the nuts are largely exported they are also extensively used in Brazil, but chiefly as food by the Indians; the Tapejos, for example, subsist largely upon them. The oil contained in the kernels is used locally, and to a small extent in commerce.

The Brazil-nut tree is a native only of South America, and it is scarcely known under cultivation outside the tropics of the New World. It was introduced to Jamaica as lately as May 1881, when 300 fruits, containing about 6,000 seeds, were obtained by the Botanical Department of that colony direct from Pará. Seeds were first of all distributed amongst cultivators and afterwards growing plants. The germination of the seeds, covered as they are with a dense woody testa, is a subject which requires some attention. If the seeds are sown in the natural state and without any preliminary preparation the period of germination may extend from a few months to nearly two years. In the report of the Director of Public Gardens and Plantations, Jamaica, for the year 1883, it is stated, "Before being planted, it is advisable to
" take the nuts out of the pericarps or fruit cases and soak them in
" water for about a fortnight, otherwise they take several months or

" even a year or two in germinating. Some nuts planted in May 1881, " without soaking, only appeared above ground in February 1883."

At Kew the results have been very much the same. The assistant curator, in a memorandum on the subject, states that " if the seeds of " Brazil-nuts are sown with shells intact, they remain in the soil a long " time without germinating. They do not, however, perish, and we have " succeeded in getting plants from seeds that have been sown over two " years.

"By removing the shells from the seeds before sowing they will " germinate in a very short time. At Kew, we had the young plants " through the soil ten days after date of sowing. The shells, in this " case, had been cracked and carefully removed from the seeds."

The introduction of the Brazil-nut tree into our Eastern and Australian Colonies was in every way so desirable an object that this establishment, which has in many ways and for a long period, served as a " half-way house " between the two tropics, was very happy to take part in it. An application having been received from the Botanic Garden at Brisbane, Queensland, for seeds or plants of *Bertholletia excelsa*, about ½ cwt. of fresh seed was obtained in June 1885, and forwarded to the Colony. The first report received on this consignment was not encouraging. The superintendent, in a letter dated 22 February 1886, states :—" I very much regret to say that the *Ber-* " *tholletia* seed, respecting which you took so much trouble, has not " been a success. Besides sowing large quantities myself without " delay, I distributed it over a wide range of Northern Queensland, " but none of the seeds germinated." It was believed here at the time that some of the seeds would still germinate if they were kept in a suitable situation ; but in order to ensure the introduction of the tree to Queensland, a second lot of seeds were forwarded in July of the present year. At the same time a lot was forwarded to the Botanic Gardens at Singapore. In acknowledging the receipt of the second lot of seeds, Mr. Cowan in charge of the Botanic Gardens at Brisbane, writes as follows :—" The previous consignment was submitted to such " treatment as you advised, with the result that there are now available " for distribution about 200 plants of this valuable tree. This second " importation will enable a thorough trial to be made in all likely parts " of the Colony."

Mr. Cantley, in reporting the arrival of the seeds at Singapore, mentions that those which were packed at Kew in moist peat had begun to germinate on the voyage. The other sent dry, had not germinated, but were placed under treatment at once. Mr. Cantley adds, " I have sent a " few of the seeds to the native states, where they are very anxious to " get anything of this kind."

The further introduction of the Brazil nut to Eastern Colonies is a matter which does not appear to require arrangements of an exceptional character. Fresh seed may be obtained in London from reliable merchants in June and July of each year, and these could be sent packed in cocoa-nut fibre or peat in an ordinary box as merchandise. On arrival, the seeds should be well soaked or the outer shell might be very carefully cracked and removed or cracked only, and the kernels sown in ordinary nursery beds. It is necessary to add that the trees do not come into bearing for some years and they evidently require to be planted in deep alluvial soils, and in sheltered situations.

The germination of the seeds of Bertholletia in the wild state, while enclosed in the wonderfully strong fruit case (which, by the way, serves as an admirable protection against monkeys and other animals), was a matter which, for a long time, was involved in obscurity. This, however,

has been cleared up by the observations of Mr. Barrington Brown, F.G.S., in British Guiana. Briefly stated, the process is as follows :—" In " each fruit case, or pericarp, when lying on the ground, there is a small " hole at the point at which it was attached to the stalk. Through this, " after the fruit has been lying for some months in a moist situation, " the shoot produced by one of the germinating seeds is able to effect an " exit. When this is done, it gradually increases in size, but still uses " the fruit case which indeed protects its roots and serves all the " purposes of a natural pot. The other seeds, unable to find an outlet " for their sprouts to reach the light and air, ultimately perish, and their " remains probably go to nourish the solitary plant which is destined to " represent the family. This latter, when it has grown to a certain " size, bursts the shell in which its roots have hitherto been confined " and grows up into a tree."

XXVIII.—CASTILLOA RUBBER OF CENTRAL AMERICA.

(*Castilloa elastica*, Cerv.)

This is one of the earliest described of rubber-yielding plants, but according to Sir Joseph Hooker (Trans. Lin. Society, Vol. II., pt. 9, p. 209), it is probable that more than one rubber-bearing species exists in Central America under this name.

The Ule of British Honduras and Nicaragua is no doubt *Castilloa elastica* of Cervantes, but what is known locally as Tunu and said to yield a "gutta-percha," is so far undetermined owing to the absence of good specimens of the leaves and flowers. The species named *Castilloa Markhamiana* (Collins, Report on the Caoutchouc of Commerce, 1872, p. 12, t. 3) has been shown to belong to another genus, viz., *Perebea* (Genera Plantarum, Vol. III., p. 372).

Plants of *Castilloa* have been widely distributed from Kew to various tropical colonies, and seed-bearing trees are now found in Ceylon, Singapore, Mauritius, Jamaica, Trinidad, and the west and east coasts of tropical Africa.

The original stock of Kew plants was obtained by Mr. R. Cross in 1875 for the India Office from the Isthmus of Panama, under the name of Caucho. The identity of the Ule of British Honduras with the Caucho of Darien appears to be not fully established. The points of difference so far noticed are, however, very slight. With regard to Ule, Sir Joseph Hooker mentions that "all the branchlets are clothed " densely with substrigose buff-coloured hairs ; the leaves are scabrid " above, and densely hirsute or hirsutely tomentose beneath. On the " other hand, Cross's indigenous specimens of Caucho, and those culti- " vated in Ceylon (derived from the same source), have the branchlets " less clothed with hairs and the under surface of the leaves less thickly " tomentose."

The above brief statement respecting the determination of the rubber-yielding plants of Central America will serve to show the present position of our knowledge of the subject.

The plants distributed from Kew, and now under cultivation in various tropical colonies, would be more correctly termed according to the place of origin *Darien Castilloa*. This would distinguish them from the Ule of Mexico, British Honduras, and Nicaragua, and sufficiently indicate their history. As regards the quality of rubber yielded by the Darien

Castilloa, the Kew Report for 1882, p. 40, gives an account of the first sample of caoutchouc obtained from this plant in the Old World.

"In October 1882, the Director of the Royal Botanic Gardens, " Peradeniya, Dr. Trimen, forwarded to Kew a sample of the rubber of " *Castilloa elastica* grown in the Experimental Gardens at Heneratgodde, " Ceylon. This was sent from Kew in 1876 (*see* Kew Report, 1876, " p. 9). The sample was submitted to S. W. Silver, Esq., F.L.S., who " very kindly reported upon it :—' On working and drying a portion of " ' this sample, the loss is 12·3 per cent; it is necessary to use warm " ' water in washing this rubber; it becomes, on drying, much darker " ' and shorter than Para rubber. It has a bitter taste, which is not " ' removed on washing. The unwashed sample yields 1·9 per cent. " ' ash, the washed sample gives 1·2 per cent. The shortness of this " ' rubber would restrict its use to some extent where tensile strength " ' or tenacity is required.' It was valued, Dec. 8, 1882, as worth " 2*s.* 9*d.* to 3*s.* per pound."

The collection and preparation of rubbers as a forest product has hitherto been almost exclusively in the hands of natives, whose only object has been to obtain as large a quantity as possible of a marketable character, without any regard to the permanency of the industry or the quality of the article produced. In many localities the rubber trees have been so ruthlessly cut down or tapped, that they have been almost annihilated. In others, the preparation of the rubber is of so rude and unsatisfactory a character, that the waste must be enormous. Under these circumstances it is most important to extend knowledge of the subject, and it is to be hoped where rubber trees still exist under British influence, that careful steps will be taken to regulate the tapping or bleeding, and to re-plant areas already denuded of trees.

In the special instance of the rubber industry at British Honduras we have been lately favoured with the following correspondence :—

Colonial Office to Royal Gardens, Kew.

" Colonial Office, Downing Street,
" Sir, 11th November 1887.

" I am directed by Secretary Sir Henry Holland to transmit to " you a memorandum on the cultivation and preparation of india-rubber, " which has been prepared by Mr. Alvan Millson, who was formerly " a district magistrate in British Honduras, and has now been appointed " to be a district commissioner in the colony of Lagos.

* * *

" I am to request that the memorandum, which is sent in original, " may be returned with your reply.

" I am, &c.,
" D. Morris, Esq. (Signed) John Bramston."

Notes on Castilloa Rubber Tree of British Honduras, by Mr. Alvan Millson.

There is but little to be added to the admirable account given by Mr. Morris (now of Kew) of the *Castilloa elastica* in his book on the colony of British Honduras; but the cultivation and preparation of india-rubber is of daily increasing importance, and there is little doubt that information which in any way lessens the difficulties at present encountered in dealing with this article is worthy of statement and examination.

Cultivation.—The details I am able to give with regard to the cultivation of the rubber tree are mainly founded on hearsay evidence, but

many of them have also come under my own observation. The present methods may be classified under two heads:—

(i.) Cultivation as a shade tree for other crops, and

(ii.) Cultivation for its own sake.

(i.) The rubber tree is a tap-rooted tree, of small foliage area, a lover of deep, moist, clayey loam, well shaded by undergrowth, and appears to need surrounding low bush to force it to its full height.

The natural deductions from the above facts are that while it does not exhaust the soil in which the surface rooting crop underneath it may be planted, it gives but little shade unless planted at very short distances. Until it has attained sufficient dimensions to shade *itself* (for it will not grow well if the sun gets at its trunk) and the plants beneath its branches, it must be protected by some other shade tree, its natural habitat, like that of the Jamaica pimento, being in old plantations among the under-brush that so rapidly springs up in humid soils. If planted sufficiently closely to shade its own stems, without which both the growth and flow of milk will be checked by the heat of the sun, it must of course ultimately damage the crop beneath it, and, in the case of cacao, when both crops come to maturity about the same time, both crops would be injured to an almost equal extent.

(ii.) If grown as a special crop, the seeds should be planted, I believe, at a distance not exceeding 15 feet from one another, should be left for a year or two in uncleaned ground so as to allow the under-bush to shade them and stimulate their growth,—a small area of about a foot in diameter being kept clear round each plant,—and only when sufficiently large to shade one another to a certain extent should the plantation be thoroughly brushed with a machete.

On the plantation of M. Lefebvre (No. 7, Rue des Petits Hôtels, Paris), in the western district of British Honduras, several trees planted and treated as just described reached a diameter of nine inches at a height of four feet from the ground, and flowered and fruited in less than four years. Others in well-cleaned land did not make half this progress.

Stakes, if set in the ground, make more apparent progress than seeds (seedlings should not, I think, be planted, on account of the extreme length and delicacy of their tap roots), but two or three years suffice to show that the seeds make more certain and rapid progress.

I have reason to believe that the *Castilloa elastica* affects the neighbourhood of rivers chiefly, because the bush in such places is always stunted by the floods so as to allow the rubber trees to have full growth, and is yet sufficient to give the ground and stems full shade. Under these circumstances the trees will reach a great size, while in identical soil in the open savannah they make no apparent progress.

Preparation.—A great difficulty has hitherto been found in extracting the milk from the tree in a satisfactory manner. The method now employed is wasteful both of time and of the quantity and quality of the milk extracted. I append a rough sketch of a machine* invented by Mr. Blancaneaux, of the Cayo, British Honduras, which avoids all these disadvantages.

Coagulation.—The methods which at present prevail for coagulating the milk are well described by Mr. Morris. I cannot but think, however, that a plan suggested to M. Lefebvre by a series of experiments in the spring of this year (sample of the result of which I possess, and will forward at a later date,) offers decided advantages over any other.

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* Not reproduced.

M. Lefebvre's method.—The milk is put into a barrel with a tap at the bottom, and three parts of pure limeless water are added to every part of milk. After standing for twenty-four hours the water is drawn off through the tap and the process repeated twice more. The well washed milk is then pressed slowly in a finely perforated vessel and yields a quality of rubber free alike from undue viscosity and brittleness. A sample of rubber thus prepared is difficult to distinguish from the smoke-coagulated Pará rubber which at present leads the market.

The above account, given by Mr. Millson, is printed without any expression of opinion as regards the value of the suggestions made. Experience alone can decide the circumstances best suited to the cultivation of this tree in different tropical colonies. There is also much more to be learnt and worked out as regards the best means to be adopted for tapping rubber trees, and for preparing the milk so as to yield the largest available amount of marketable rubber.

The preparation of Castilloa rubber is described by Morris (Colony of British Honduras, p. 76), as follows :—

"At the close of the day the rubber-gatherer collects all the milk, " washes it by means of water, and leaves it standing till the next " morning. He now procures a quantity of the stem of the moon-plant " (*Calonictyon speciosum*), pounds it into a mass, and throws it " into a bucket of water. After this decoction has been strained, it " is added to the rubber-milk, in the proportion of one pint to a gallon, " or until, after brisk stirring, the whole of the milk is coagulated. " The masses of rubber floating on the surface are now strained from " the liquid, kneaded into cakes, and placed under heavy weights to " get rid of all watery particles. When perfectly drained and dry, the " rubber cakes are fit for the market, and exported generally in casks."

The idea respecting the preparation of rubber, as suggested above by Mr. Millson, without the aid of the moon plant or of alum, which latter is also sometimes used, would appear to be not entirely new. In the Report on the Caoutchouc of Commerce, by Collins, published in 1872, it is stated that if the juice of plants is not procurable " about two parts of water are added to one part of milk, and allowed " to stand for 12 hours. The residue which separates from the water " is poured into vats made in the ground and left to dry. This " drying takes from 12 to 14 days. Sometimes the milk is simply " poured on prepared ground, and the watery portion allowed to evapo- " rate or otherwise disappear. The rubber, when dry, is subjected " to pressure in order to get rid of the *bolsas* or pockets of watery " liquid."

D. M.

LONDON: Printed by EYRE and SPOTTISWOODE,
Printers to the Queen's most Excellent Majesty.
For Her Majesty's Stationery Office.
[16855.—500.—12/87.]